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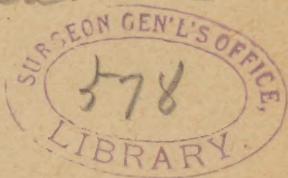
BRAIN SURGERY AND OPERA-  
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*presented by the author*



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# BRAIN SURGERY AND OPERATIONS, BASED ON CEREBRAL LOCALIZATION.\*

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IN the recent revival of the scientific study of medicine, no department has been more thoroughly investigated than has neurology, especially that portion of it which pertains to the physiological knowledge of the brain and its functions.

A few years ago it was hardly recognized as a legitimate branch of medicine, nor was it taught in the schools as such. The metamorphosis from a confused mass of undigested facts into a science, based on a universally accepted classification and terminology, is due to the researches of specialists of our own generation. This was partly due to the general scientific awakening which all medicine has experienced, and to the fortunate fact that such men as GOWERS, CHARCOT, BROWN-SÉQUARD, and our own BEARD were workers in this field, but more especially to the great advance in surgery, founded on PASTEUR's germ in-

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vestigations and LISTER's practical application of them. In this way there was opened an entirely new territory, allowing the investigation of many cavities hitherto unexplored. The skull of man as well as of animals has been trephined, the brain convolutions exposed, and many important observations made. But this very success has, by attracting undue attention from the general profession, induced the belief that much of the knowledge, which is simply tentative and only of value in furthering physiological and pathological brain investigation, is of such exact scientific value that operations for the relief of morbid brain conditions can be based upon it. While it is not within the scope of this paper to discuss in detail cerebral localization, yet so many operations have as a basis the possibility of accurately localizing brain lesions that it will be necessary to summarize our knowledge and to indicate its present status.

In 1870 FRISCH and HITZIG exposed the Rolandic region of a monkey's brain, and found that the muscles of the body responded to electrical stimulus applied to the cerebral cortex, and that they could, at will, produce a given motion by irritating a definite brain area. FERRIER, HORSLEY, MONK, and a host of others carried out similar investigations, with the result that many brilliant discoveries were claimed. They not only attempted to associate certain definite areas of the cortex with localized motion, but established centers for sensation, speech, and the special



senses, as well as the higher mental faculties. They not only claimed that irritation of these centers would stimulate into action the functions over which they presided, but, by destroying these centers, further attempted to show that lasting paralyses resulted, thus proving that the brain cortex was composed of cells with differentiated functions. That these deductions have been proved to be well-established facts has been so persistently claimed that they are now almost, by common consent of the profession, believed to be scientifically established. Yet the specialist who accepts these theories, desiring to encourage all legitimate aids in the advancement of his work, is required to so definitely locate the disease as to base a surgical operation upon it; yet he is the first to acknowledge that nothing like precision has been obtained, and at best will give an opinion with many reservations. Granting that the lesion is in the Rolandic region and on the cortex, paralysis of a group of muscles can be traced to its proper brain area, yet so many points of disease may exist, and so often are they at some point within the cortex, that even motor lesions can not be accurately located.

As regards cerebral localization generally, neurologists may be said to be grouped into three schools. One extreme teaches that the brain acts as a whole; the other that it is sharply divided into well-defined areas, which not only preside over certain functions, but when these areas are destroyed, permanent disabil-

ities result; while the third school, which consists of probably the most eminent and certainly the most conservative neurologists, believes that, while certain portions of the brain do preside over certain functions, yet, if they are destroyed, other portions can assume this supervision. If cerebral localization had reached that state of perfection which many take for granted, specialists would be able to systematize and map out the brain cortex, very much as the keyboard of a piano is divided; and if asked to produce either an isolated motion or a series of movements by electrically irritating the brain, they would succeed with all the accuracy of a musician, who can at will either strike a given note or produce a musical harmony; and who can not only detect a discord, but point out the faulty note and give proper directions for its remedy. But investigators have by no means attained this perfect knowledge, and are far from agreed as to many important centers. Other departments which come more directly under general medical observation are more justly judged. The germ theory of disease and its many unsolved problems are still under judgment, and none the less is thought of those who so assiduously work in this field because they have discovered no universal germ-destroyer. We are content to accept the theory and to patiently await the panacea. This panacea is at one time carbolic acid, at another the bichloride, again it is the attenuated principle of the disease itself, and at the present time it seems to be the cathode ray.

No matter what it is, we accept it seriously, and wait for the next announcement.

That our researches in cerebral localization have not resulted in more definite knowledge does not, by any means, argue ultimate failure; yet the problems to be solved are so complicated, and the many obstacles to be overcome in applying rules for certain surgical procedure are even now so apparent, that we should not encourage too much dependence on what at best must remain a knowledge difficult of application. For this reason it seems well to differentiate those morbid states in which we may be of practical assistance to the surgeon from the many hopeless diseases, and to indicate the conditions under which surgical interference is allowable. Some of the nervous diseases which are purely functional, as well as many having an organic basis, have been accepted by the surgeon as within his legitimate domain. These claims have not always been without reason, yet many times the temporary benefit claimed for the operation is either purely suggestive or is counterbalanced by the direct injury inflicted.

Such operations as nerve-stretching and section for locomotor ataxia and neuralgia, trephining for cerebral abscess, hemorrhage, tumor, epilepsy, and many other nerve and brain lesions, are of daily occurrence, and our medical journals teem with brilliant cases that recover, but little or nothing is heard of the many failures which go unregistered. For this reason often too

much faith is begotten, and reckless surgery results. I will briefly discuss a few of the diseases in which operative procedures are recommended, and will attempt to indicate under what conditions they can be advised.

**Cerebral Abscess.**—To diagnose an abscess of the brain is always difficult, and the focal symptoms are usually so slight that localization is impossible except when this condition is the result of an aural inflammation.

Yet one of the most common operations is to lay bare the brain and introduce aspirating needles for the purpose of locating the abscess. When the abscess is found and drained, even though death results, we yet feel that it was scientifically accomplished and worthy of report. A few successful cases have been recorded, but in the great majority the fatal termination is only hastened.

**Fractures of the Skull.**—In recent fractures of the skull surgical interference is often desirable. The old fear of converting a simple into a compound fracture has, under aseptic precautions, disappeared. Injury to the tissues and a fracture of the bone already existing, no additional injury can, as a rule, be done by making an exploratory incision. This is especially true of penetrating fractures and those occupying a limited area, but when the injury is great, and especially when there is no reason to believe that there is a counter-fracture, with injury to the brain substance,



interference is not advisable. Very often a blow upon the skull, though not sufficient to produce fracture, may rupture a blood-vessel, usually a branch of the middle meningeal, and, if the symptoms be sufficiently marked to render certain the diagnosis, trephining is always indicated. If the fracture is of ancient date, it should not, as a rule, be interfered with. Many insanities and epilepsies are traced to injuries received either in childhood or antedating by a length of time the development of the neurosis. If the symptoms were not so marked at the time of receiving the injury as to call for operative procedure, it is seldom good surgery to disturb existing relations.

**Tumors of the Brain.**—The possibility of localizing brain tumors, and operative measures for their removal, have been more fully discussed than has any other of the practical questions which have arisen in the discussion of cerebral localization. It is the common ground on which the surgeon and neurologist meet, and it has been made the crucial test of the truth or falseness of the theory. The surgeon demands directions so specific as to accurately place the trephine over the growth—not accomplishing which, the operation will be a failure, at least from his standpoint. While the text-books assert the possibility of thus accurately defining the brain area, and the few cases where this has been accomplished have been so widely published as to engender faith in its possibility, we who attempt this and, after most careful consideration,

either refuse to attempt localization or hedge our opinion with many reservations, know that at best localization is uncertain. Were tumors always encapsulated and situated on the cortex and in the Rolandic region, they would be much more easily localized and removed. But, as a matter of fact, it is difficult either to locate their position or to even name the kind of tumor that we will find.

As tubercles, they may simply irritate; as sarcoma, they may attack connective tissue wherever found; or, as glioma, they may involve and become a part of the brain substance itself. Though a brain tumor may be present, it is not necessarily easy of diagnosis, and frequently the post-mortem gives us the first intimation of a condition which had been supposed to depend on a lesion in some other organ.

But, granting their easy diagnosis and the fact that they could be unerringly located by the focal symptoms they produce, suppose even that the cathode ray, so long an electrical toy, should accomplish the wonders for the brain that it is said to have done for the bones,—it is still doubtful whether the surgeon would have any right to interfere with these morbid growths. Take tubercles, for instance, which compose a large percentage of the tumors found in the young: What benefit could result in the removal of one or two, when they may be diffused over the whole brain? The same can be said of gumma due to syphilis.

In both conditions the tumors are the result of a systemic disease, and it is the system, not the morbid product, which is to be treated.

Sarcomas and gliomas, by the very nature of their origin and surroundings, can not be successfully removed.

Encapsulated tumors, situated on the cortex, are but rarely found and still more rarely diagnosed. DANA says that not five per cent of tumors are removable; and when it is remembered that these include gumma, tubercles, and sarcoma, the practical results are *nil*. Thus it seems that little is to be expected from surgical interference based on any aid that cerebral localization may furnish.

Certainly in not one out of a hundred cases can anything like a scientific opinion be expressed. Speaking broadly, the only benefit which can arise is that, oftentimes, trephining on any portion of the brain does for a time relieve the pressure symptoms. To cut down on the brain simply because a tumor has been located is only to be recommended when it has for an object the relief of pressure. For this purpose it is not necessary to trephine absolutely over the morbid spot in order to give relief.

**Craniectomy.**—In the year 1890 LANNELONGUE, a French surgeon, believing that congenital idiocy was due to the early closure of the fontanels, advocated a new operation to overcome this fault of nature. He advised the removal of two strips of bone on either

side of the sagittal suture extending from the forehead to the occiput. His theory was that, by giving greater room for brain expansion, mental power would be notably increased. His theory was eagerly accepted, and the usual claims put forward through the medical journals. Many deaths have resulted and little mental improvement has been noted in those who have survived the operation. As a matter of fact idiocy is not the result of, nor is it usually accompanied by, unduly early closure of the fontanel, the lesion producing this mental condition being so widespread that linear craniotomy could not materially influence this disease.

**Epilepsy.**—Surgical claims for the cure of epilepsy are so persistently put forward and stoutly maintained, and appear in such devious and plausible guises, that it would seem that no case has been properly treated unless the eye muscles have been subjected to tenotomy, the turbinated bones of the nose excised, the ovaries removed, or the skull trephined. All kinds of operative procedures have been recommended for its cure. As a matter of fact, any operation that acts on the mind of the patient may for a certain length of time result in benefit. The pathology of the disease is not known, its etiology is in nearly all cases heredity, and in the great majority no cure is possible. In both epilepsy and insanity the patient's condition is generally accounted for by a fall upon the head, or some other traumatic injury to the brain. All heads are full of lumps and depressions, and, when these are



subjected to a person of strong imagination, pathological changes are easily diagnosed. If an operation be based on this, and the skull be trephined, a temporary benefit may result, whether or not the slightest change is found. But this improvement is only temporary, and the last condition of the patient is worse than the first. That epilepsy may follow a blow and be directly caused by the resulting pathological change is not denied.

When this causative relation can be clearly established, and the injury is recent, trephining is always indicated. But if years have elapsed, and the brain has become accustomed to its new surroundings, the meninges, as well as the brain, will have undergone such pathological change that no operation can benefit. Conservative surgeons no longer claim epilepsy, with general convulsions, as properly within their province. The so-called Jacksonian epilepsy, involving one of the extremities or group of muscles, which is supposed to be produced by a cortical lesion, may be considered from a surgical standpoint; yet we know little more of the pathology of this form than of *grand-mal*. Because the hand, leg, or arm is involved, it by no means proves that there is a tumor in the corresponding area of the cortex.

Beyond all question we have rushed into the field of brain surgery to a far greater degree than can possibly be justified. Aseptics have rendered us reckless in this as well as in other fields, but the results are far

more disastrous. Other organs can be opened, and an exploratory incision will, in time, heal, leaving the parts but little the worse for interference.

But in trephining the brain, permanent injury is often sustained. The surgeon, cutting down on the brain, opens the meninges and creates an artificial apoplexy and a temporary inflammation which may subside, but which always leaves a scar. Occasionally a hernia cerebri develops; but when neither this nor any other appreciable lesion results, yet the brain is so delicate an organ that it is often deleteriously affected. Surgeons tell us that the button of bone can be replaced and reossification established.

This may happen, but as a rule it does not happen, and the brain, in place of its bony covering, has simply a fibrous membrane for its protection. Epilepsy, as well as other disturbances of the nervous system, not infrequently results.

**Conclusion.**—Summarizing the whole subject, it can be positively asserted that, by the very nature of the investigation, cerebral localization can only in exceptional cases be of material assistance to the surgeon; that the trephine may be used to elevate a depressed fracture, check a traumatic hemorrhage, or remove the pressure symptoms of a tumor, and that great care should be exercised lest injury may result, which will counterbalance any hoped-for success.



